

led him to undertake numerous subsidiary investigations, some dealing with isomorphism, some with the diffusion and specific heats of salt-solutions. His researches on the double salts of fluorine and potassium with silicon, titanium, tungsten, zirconium, niobium and tantalum, and on the rare earths were all part of his scheme to ascertain the true relations between the atomic weights of the elements. During the forty-five years of his scientific activity, he determined the equivalents of no fewer than twenty-eight elements. Besides these labours, he added to our knowledge of ozone and conducted experiments with Foucault's pendulum.

M. Ador's sketch of Marignac gives an interesting summary of this work, adding also a sketch of the part which he took in developing the modern aspect of chemistry, in adopting the now familiar means of deducing atomic weights from the equivalents determined by analysis.

The present volume is the first of a series of reprints of Marignac's original papers, most of which were published in the "Archives de la Société d'Histoire Naturelle de Genève." The typography and arrangement leave nothing to be desired, and M. Ador has conferred a benefit on his fellow-workers by the labour of love which he has so successfully carried out, and has paid the best possible tribute to the revered memory of his old master.

W. R.

A MANUAL OF PHYSICAL GEOGRAPHY.

An Introduction to Physical Geography. By Grove Karl Gilbert and Albert Perry Brigham. Pp. xvi + 380. (London: Hirschfeld Brothers, Ltd., 1902.) Price 5s. net.

IT might reasonably have been supposed that there was no field in the United States for a new concise manual on physical geography. Yet the cooperation of one of the most original observers of geological phenomena with the practical teacher of geology in Colgate University has given us a book that we should be very sorry to lay aside. It has, like many of its rivals, been brought unmodified into the English market, where it will appeal to teachers rather than to junior scholars. It would be, indeed, no more suited, with its wealth of American illustration, to European classes than Huxley's description of the Thames Valley would be to dwellers on the Mississippi or the Hudson. But in the continent of North America this little book should take a foremost place. The abundant photographic illustrations are excellent and well chosen. They are not reduced, as in some small text-books, to blurred patches which suggest no natural landscape. The process-blocks seem to us to vary slightly in grain, whereby some of the smaller ones have been brought to a rare degree of delicacy; the sand-ripples on the dunes in Fig. 83 will serve as an example. To name two other suggestive pictures, the contrast of delta and cliff in Fig. 37, and the geognostic details of the "creeping" rock-surface in Fig. 59, are especially well presented.

The style of the text forces the meaning of the illustrations on the reader. The same firmness appears in Mr. Gilbert's "Geology of the Henry Mountains" and "Lake Bonneville," but the effect is there modified by a

far more classical terminology. Whether or no joint authorship is responsible for the diction in the present book, the result may be commended as a consistent work of art. These short, direct, eminently English sentences are not easy to write, but are delightful to read and are perfect for their purpose.

The current system of importing American books intact under the name of a London publisher leaves us, even in this case, with such spellings as "oxid" and "sulfur," and such antique words as "sled." While Prof. Brigham writes "bowlder," the joint authors, however, give us our own form, "boulder." "Glen" and "dale" may be, as stated on p. 28, "somewhat poetic" in America, where "gulch" is common, but they are fortunately familiar to every hillman in our islands. Yet these are trifles in a book that appeals to us as much by its style as by its subject.

The authors conceive geography (p. 13) as a comprehensive knowledge of the earth, and their book as a first book of science, similar, we take it, to Huxley's "Physiography." They attract attention to the features seen in any walk across the country, and correlate these with the striking phenomena of high mountain regions, volcanoes and so forth. On p. 209 the recent eruptions in Martinique are judiciously introduced.

There is little experimental method in the book; the rain-gauge, for instance, is mentioned, without any statement of how a reading can be made in actual practice; the chemical characters of limestone are given, without a hint of how the material may be interestingly dealt with by the pupil. The teacher will, however, supplement the book in these matters, and its clearness of description cannot fail to give him new conceptions. What can be better, for instance, than the remark (p. 279) that "the ocean may be likened to a film of liquid clinging to the outside of a spoon"? We should like to quote some of the more vivid passages, such as the contrast between life in the Alps and in the Rocky Mountains on pp. 191-2. We do not agree with the authors in their discussion of passes in the Pyrenees and Alps, or as to "the somber skies of Germany" (p. 195), when Baden and Bavaria are referred to; but we should probably be far more at fault were we to illustrate—or, as the authors say, "illuminate"—a European text-book by remarks on Georgia or Colorado.

GRENVILLE A. J. COLE.

A PICTORIAL ARITHMETIC.

The Modern Arithmetic. Primary and Elementary Grades. By Archibald Murray, A.B. (Harvard). Woodward Series. Pp. 308. (St. Louis, U.S.A.: Woodward and Tiernan Printing Co.)

THIS is a book for the use of a teacher of very young pupils. It is divided into three parts. Part i. (82 pages) is concerned with "number exercises," and consists of thirty-eight lessons, each one of which we may suppose to occupy the child for one day. Each of these lessons consists of a series of questions or directions given to the pupil, such as "hold up seven fingers," "find, by using splints, the half of ten units," &c. A marked feature of this part of the book is the beautiful series of coloured pictures of roses, apples, grapes, strawberries, oranges, finches, redbirds and other interesting

objects which it contains, while the interest and curiosity of the young pupil are further secured by a good drawing of a spider and his web, as well as by an excellent picture of a pair of boots.

This part of the book deals, then, as the author says, solely with ideas of comparison, measurement and counting. The extent to which we get in part i. may be inferred from the last two questions or problems in it:—

"A book cost 3 dimes, a pencil 3 cents, and a blank book 3 nickels. How many cents did all three cost? Count from 1 to 30; from 5 to 100 by fives. Count as high as you can by hundreds."

Part ii. treats of the elementary operations—addition, subtraction, multiplication, division—and the meaning of fractions (halves, thirds, quarters, &c.) is gradually unfolded during these operations. The pictorial method is continued in this part, but the pictures are of the geometrical kinds that we get by cutting out and folding paper, so that the measurement of simple areas and the nature of an angle are explained to the little learner. Thus, one of the things here learnt by folding is that the sum of the angles of every triangle is two right angles. Near the end of this part, the nature of a decimal is explained, and the extent to which the pupil has progressed may be seen by the following, taken from the last lesson in part ii.:—

"At the rate of 56 miles per hour, how far will a train travel in 5.6 hours? A bookseller paid \$9 $\frac{3}{4}$ for books. How many did he buy if each cost \$ $\frac{3}{8}$?"

Part iii. treats of "elementary operations classified," that is, the operations of part ii. are treated more in detail and the philosophy of the subject is expounded. Near the end, the nature of ratio and proportion is explained, instruments, such as a two-foot rule, being employed. Among the terminal problems in this part are the following:—

"Express 9 cu. yd. as a decimal of a cord" (from which we conclude that the author does not anticipate an early introduction of a thorough-going metric system into America); "what is the sum of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{7}{8}$?" The rate of taxation of a city is 1 $\frac{1}{2}$ %. What tax must a citizen pay whose property is assessed at \$4500?"

There are no answers supplied to any of the questions (except in two or three instances) throughout the book; it is, as we have said, a guide to the teacher; the young pupils for whose instruction it is intended are not yet *students*.

Of course, the American coinage, with which the questions deal, would require alterations to render the book suitable to English use; but there is no doubt that the author has very skillfully conceived the nature of an effective process of teaching young children, and we think that the exact following of his course and method would prove to be productive of excellent results.

OUR BOOK SHELF.

The Trees, Shrubs and Woody Climbers of the Bombay Presidency. By W. A. Talbot, F.L.S. Second Edition. Pp. xxv + 385. (Bombay, 1902.)

WHEN Sir Joseph Hooker's "Flora of British India," now completed, was undertaken, one of its main objects was stated to be to furnish a basis on which local floras could be constructed. India is so vast, its climatic features are

so varied, the economic requirements of its several provinces so diverse, that a general work like that of Hooker needs to be supplemented by local floras in which the special requirements of particular districts can be fulfilled. There is gratifying evidence to show that these requirements are in course of being supplied. There is, for instance, the "Forest Flora of the North-West," by Sir Dietrich Brandis; Sir George King is engaged on the "Flora of the Malay Peninsula"; the "Flora of Ceylon" was completed by the late Dr. Trimen; and General Collett's book on the plants of the Simla district has just been published. We might cite many similar works from the pens of Prain, Clarke, Duthie, Watt, Kurz and others, but enough has been said to show that Sir Joseph Hooker's aim is in process of fulfilment, and that the splendid botanical heritage handed down to us by Roxburgh, Wallich, Wight, Griffith and others is in no danger of being squandered, but is being utilised and extended by the labours of the present race of botanists. When we bring to mind the fact that instruction in botany, at any rate in systematic botany, no longer forms part of the curriculum in the education of medical students, and that complaints have been made as to the lack of interest felt in the subject by the majority of forest officers, this evidence of substantial progress may at least be adduced as a set-off.

The work before us is another instance of the same kind. In form it is modelled upon Hooker's "Flora," in substance it contains a "fairly correct" list of the indigenous ligneous vegetation of the Presidency, together with additional matter relating to distribution, bark, woods and economic products, along with a large number of vernacular names.

The book is in its second edition, and hopes are thrown out that the "next edition" will expand into a handy Bombay forest flora. Actual use in the field or forest, or even in the herbarium, is needed to enable the reviewer to form a complete estimate of the value of such a work. It must suffice to say that the author's method is good, and that it bears the impress of care and accuracy in its production.

La Géologie générale. By Stanislas Meunier, Professeur de Géologie au Muséum d'Histoire Naturelle. Pp. vi + 336; 42 woodcuts. (Paris: Alcan, 1903) Price 6 francs.

In this volume, Prof. Stanislas Meunier undertakes, for the International Scientific Library, a presentation of those branches of geological science not already dealt with in his "Experimental Geology" and his "Comparative Geology," published in the same series.

In the introduction to the book, the author defines the ideas which have successively dominated geological theory during the nineteenth century as (1) the cataclysmal views of Cuvier; (2) the uniformitarianism of Lyell; (3) the "actualism" of Constant Prévost; and (4) the "activism," which he regards as the distinctive feature of modern geological thought.

In conformity with this latter point of view, the author then proceeds to discuss the three great causes of change in the earth's crust, namely, the central heat of the globe, the effects of pressure and the influence of the sun's heat. Pursuing this deductive, rather than inductive, mode of treating his subject, the questions next considered are the flexible earth's crust, volcanoes, the action of subterranean and superficial waters, the sea, glaciers, the atmosphere, and vital action. In dealing with each of these subjects, the originality of the author is everywhere manifest, the examples and illustrations chosen being, for the most part, new, and often of a very striking character.

In the second part of the work, which is entitled "Comparative Physiology of Successive Geological Epochs," the effect of the several agencies enumerated